

## EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	90	dull near2 razor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/10/24 07:46
L2	22	(dull near2 razor) and (filter or image)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/10/24 07:48
L3	12	(dull near2 razor) and (MRI or CT or xray)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/10/24 07:51
L4	5	(blunt near2 razor) and (MRI or CT or xray)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/10/24 07:52
L5	174	(dull near2 blade) and (MRI or CT or xray)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/10/24 07:54
L6	473	(razor) and (MRI or CT or xray) and image	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/10/24 07:55
L7	0	(dull-razor) and (MRI or CT or xray) and image	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/10/24 07:56

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L8	0	(dull-razor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/10/24 07:56
L9	0	dull-razor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/10/24 07:56
L10	3	shave adj operator	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/10/24 08:00
L11	1	dullrazor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/10/24 08:00
L12	933	(selectiv\$4 near filter\$5) with image	US-PGPUB; USPAT	OR	ON	2007/10/24 09:06
L13	0	(selectiv\$4 near filter\$5) with image and segment\$6	US-PGPUB; USPAT	OR	ON	2007/10/24 09:22
L14	39	(filter\$5) with image and segment\$6	US-PGPUB; USPAT	OR	ON	2007/10/24 10:02
L15	32	multiple near correlation and (grid or mesh or array) and reconstruct	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/10/24 12:40
L16	1285	(382/254).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/10/24 12:45

## EAST Search History

L17	328	(382/152).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/10/24 12:45
L18	1613	L16 or L17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/10/24 12:45
L19	85	L18 and (vision adj system)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/10/24 12:45
L20	31	L19 and (mask or exclu\$6)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2007/10/24 12:45

## EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L22	95	(camera and ((extra\$8 or unwanted\$3) with (feature or edge or structure)) and filter).CLM.	US-PGPUB	OR	ON	2007/10/24 13:35
L23	1	(camera and ((extran\$8 or unwanted\$3) with (feature or edge or structure)) and filter).CLM.	US-PGPUB	OR	ON	2007/10/24 13:35
L24	16	(camera and ((extran\$8 or unwanted\$3 or undesir\$4) and (feature or edge or structure)) and filter).CLM.	US-PGPUB	OR	ON	2007/10/24 13:36
L25	4	(camera and ((extran\$8 or unwanted\$3 or undesir\$4) same (feature or edge or structure)) and filter).CLM.	US-PGPUB	OR	ON	2007/10/24 13:38
L26	8	(image same ((extran\$8 or unwanted\$3 or undesir\$4) same (feature or edge or structure)) and filter).CLM.	US-PGPUB	OR	ON	2007/10/24 13:38


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## Dullrazor<sup>®</sup>: A software approach to hair removal from images

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### Abstract

Recently, there has been a growing number of studies applying image processing techniques to analyze melanocytic lesions for atypia and possible malignancy and for total-body mole mapping. However, such lesions can be partially obscured by body hairs. None of these studies has fully addressed the problem of human hairs occluding the imaged lesions. In our previous study we designed an automatic segmentation program to differentiate skin lesions from the normal healthy skin, and learned that the program performed well with most of the images, the exception being those with hairs, especially dark thick hairs, covering part of the lesions. These thick dark hairs confused the program, resulting in unsatisfactory segmentation results. In this paper, we present a method to remove hairs from an image using a pre-processing program we have called DullRazor<sup>®</sup>. This pre-processing step enables the segmentation program to achieve satisfactory results. DullRazor<sup>®</sup> can be downloaded as shareware from <http://www.derm.ubc.ca>.

**Author Keywords:** Hair removal; Skin imaging; Image processing; Grayscale morphology Adaptive median filter

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